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UNITED STATES DEPARTMENT OF AGRICULTURE  
LONG RANGE PROSPECTS FOR AGRICULTURE 1/

Nature of Study

Studies of long range prospects for agriculture can be of value for many purposes. Almost every action taken by an individual, a firm, or Government making a commitment that is to extend over several years involves an implied or explicit appraisal of the future. This is a progress report on a study that is designed primarily to provide guidelines for production research programming.

In the study reported here no attempt is made to "forecast" the long-run demand for or the supply of agricultural products. Rather, the technique used is to develop future demand and supply prospects under a logical set of assumptions centered at about 1975. Population was projected to about a third above the 1951-53 average. And an economy producing about double 1951-53 output of goods and services appears quite probable even under rather conservative assumptions concerning growth in labor force and productivity. Such an expansion would suggest an increase in real income per person of about two-thirds above the 1951-53 average.

Considerable progress has been made in the research work on three major phases of the study: (1) Projections of requirements for farm products in 1975; (2) projections of changes in the area of cropland and pastureland; and (3) estimates of economic maximum and attainable increases in crop yields based on presently known technology. Comparison of production possibilities with projected requirements for farm products reveals some of the likely problem areas in which the need for development of new technology is relatively greater and also reveals major types of production-adjustment problems that need to be solved.

Before presenting these first approximations of the prospects for agriculture, it should be remembered that they are based on a set of assumptions. The conditions assumed are considered reasonable but many forces, economic and otherwise, might enter the picture and modify the prospects for agriculture. Specifically, a growing economy and a high level of employment is assumed. Furthermore, the economic framework does not allow for war or for a highly mobilized economy. Favorable cost-price relationships to farmers also was an important assumption of the study. The assumption of known technology is conservative. A burst in technological development could modify the demand for farm products or step up production prospects materially. Changes in cost and price relationships from those now realized could affect both projected levels of supply and demand. But it would be well to remember that to set the necessary expansion in farm production, farm prices and incomes must be favorable.

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1/ Summary of report presented before the National Agricultural Credit Commission, Chicago, Illinois, June 6, 1955. The section on Demand for Farm Products was prepared by Rex F. Daly, Agricultural Marketing Service, U.S.D.A.; Supply Prospects and Implications was prepared by Glen T. Barton, Agricultural Research Service, U.S.D.A. Other research workers in U.S.D.A. have contributed to the study on which this report is based.



## Demand for Farm Products

Growth in agriculture depends primarily on expansion in the demand for farm products. Population growth will contribute most to demand for agricultural products in the next two decades. The study assumes a population increase of about a third from the 1951-53 average to 210 million people by 1975. This compares with a range in Census Bureau projections of 200 to 221 million. If population continues to grow as rapidly as in recent years, by 1975 the population could well be at the high of the range.

## Income Effect on Consumption

Total food consumption per person is not affected much by changes in income and prices. However, the response of consumption to changes in income varies widely for individual commodities. Past trends indicate a decline in per capita consumption for such commodities as grain products and potatoes. At the other extreme, frozen fruits and vegetables have shown relatively large increases in recent years. Moreover, a survey of family food consumption made in 1948 by Human Nutrition and Home Economics Research, ARS 2/, found that at the higher income levels as income increased consumption tended to decline for flour, meal, and cereals; sugars and sweets; potatoes; fats and oils and bakery products. Consumption tended to rise as income increased for most livestock products and for fruits and vegetables, with frozen fruits and vegetables showing the largest relative gain.

In this study prospective demand was built up by commodities, using statistical measures of the response of consumption to changes in income, trends in consumer preferences and, in some instances, the judgment of commodity specialists. Projected use of farm products by 1975 relative to the increase in income, according to a preliminary summarization of individual commodities, would imply an overall income elasticity somewhat below current estimates--perhaps around 0.15 or 0.20 at the farm level. That is, a 10-percent increase in income may result in a  $1\frac{1}{2}$ - to 2-percent increase in per capita use of farm products. This response is somewhat smaller than was reported in some studies based on past years. Recently, most statistical analyses indicate an income elasticity for total food consumption of around 0.25. These analyses were based on a retail-price-weighted consumption index which reflects some marketing and processing charges and thus may be too high to measure the effect of income on demand at the farm level. Moreover, there is evidence to suggest that the effect of income on consumption may diminish as consumer incomes rise over time.

## Consumption Trends and Requirements

Food consumption per person, as measured by a retail-price-weighted index, may increase around a tenth by 1975 from the 1951-53 average. An equivalent increase in per capita use at the farm level would be somewhat smaller. Both these projections reflect the rise in real income and approximately recent price relationships. Many past trends in our eating habits are expected to continue in the next two decades. Per capita use of wheat, potatoes, and dry beans and peas are likely to decline--continuing past trends. But with more people, total consumption would show some increase. Per capita use of fats and oils probably will change little in total. Although consumption of fluid milk per person is expected to rise, the increase in combined use of milk and milk products may be moderate.

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2/ Food Consumption of Urban Families in the United States, USDA, AI Bulletin No. 132, p. 43.

Rising incomes are expected to increase per capita demand for meats and poultry to levels perhaps a sixth above the 1951-53 average. Per capita consumption of fruits and vegetables would also rise appreciably in the projected framework with substantial increases indicated for citrus and for some leafy green and yellow vegetables. Nonfood uses of farm products are expected to rise. However, competition of synthetic fibers and technological developments in the making of soap and paint may make inroads in the per capita demand for fibers and oils, unless there are compensating technological developments expanding the use of these commodities. Per capita use of tobacco will likely continue to increase unless future medical findings should curb its use.

The export market is very difficult to appraise. On the basis of past trends, exports may well hold around levels of recent years and may continue to be an important outlet for wheat, cotton, tobacco, rice, and fats and oils.

Total domestic demand for farm products with the projected rise in population and per capita use would increase around 45 percent from the 1951-53 average. The increase in total demand, allowing for exports, would be a little smaller--possibly around 40 percent. Requirements for meat animals and poultry would increase by more than 50 percent with largest relative gains for beef. Use of feed would rise with the increase in demand for livestock products and the need for some protein feeds may increase substantially. Indicated requirements for fruits and vegetables will rise more than population. Total domestic use of fats and oils and cotton may increase at about the same rate as population although somewhat smaller increases are indicated for food grains and potatoes. An increase in output of about a third from 1951-53 levels would be needed to meet the projected 40-percent increase in requirements as production of some products exceeded requirements for domestic use and export in 1951-53. Inventories of livestock, wheat, cotton, corn, and fats and oils were accumulated during this period and shipments to foreign countries were relatively large for several commodities.

### Supply Prospects and Implications

Since World War I farm output for human use in the United States has increased at a slightly faster rate than has population. During the last third of a century, the total acreage of land used for crop production for the United States as a whole has remained virtually constant. However, there have been considerable changes in areas used for crops, such as shifts away from eroded hill land, to more fertile drained bottom land and level grassland, and from dry farmland to irrigated land.

Two chief factors have accounted for our increase in output since World War I. Cropland and other production resources used for producing feed for horses and mules were released for production for market as tractors and other motor vehicles supplanted horses and mules as a source of farm power. A rise in crop yields also aided greatly. The shift from animal to mechanical power accounted for half the increase in output from World War I to World War II. Since the end of World War II, the shift toward mechanical power has accounted for about a fourth of the increase in farm output. In the latter period the rise in crop yields per acre overshadowed the shift from animal to mechanical power as a factor in the increase in output. Relatively little additional shifting can come from the latter source, however. The size and difficulty of the production job ahead should be appraised in the light of this historical background.



## Size of Production Job Ahead

The projections of requirements for farm products in 1975 would mean a farm output about a third greater than in 1951-53. This would call for an average annual rate of increase of 1.3 percent compared with the longtime rate of 1.5 percent from World War I to the present. Although the required annual increase in output is only about two-thirds as great as the rate of increase during World War II and the postwar period as a whole, it would be about the same as the rate since World War II.

Total crop production in 1975 would have to be about a fourth larger than in 1951-53. This would mean an average annual rate of increase slightly higher than that since World War I. Required production of livestock and livestock products in 1975 would be around 45 percent above 1951-53. This would call for an average annual increase about equivalent to the longtime rate of change.

From an overall viewpoint, and judged by past trends, the size of the production job ahead is not likely to exceed the improvements that agriculture can attain. However, some of the important problems involved in attaining our production needs loom more clearly when the pattern of future production needs is considered.

The greatest increase needed in crop production would be in the feed crops--feed grains, hay, pasture, and soybeans (our chief source of protein feed). Crops for which little or no increase in production would be needed include the major food grains. Potatoes and cotton are examples of crops whose production would need to be increased less percentagewise than the projected increase in population.

## Possibilities for Increasing Output

Release of cropland and other production resources, because of further decrease in the number of horses and mules on farms, will be a nominal factor in increasing output in the future. This means that increased production by 1975 will depend chiefly on greater per acre yields and on changes in cropland area and shifts in land use. A preliminary appraisal of our supply possibilities, assuming presently known technology and favorable price-cost relationships, to farmers follows.

Considerable acreages of both grassland pasture and woodland are suitable for improvement or development as cropland and improved pasture. Preliminary findings indicate that cropland area may increase by about 7 percent by 1975. This projection is based on trends in the last 10 to 15 years and on planned reclamation developments. Such an increase in cropland area would go only part way toward meeting our additional needs for farm output. More land would be available for development if it were economically desirable. This it becomes a question of the relative economy of alternative ways of increasing output.

Chief reliance on meeting production requirements by 1975 probably will depend on our ability to increase crop production per acre. Natural scientists and agricultural economists in the Agricultural Research Service have jointly developed estimates of yields that would be economically attainable by 1975 from fuller use of presently known technology. Tentative conclusions from analysis of these data indicate that the greatest need for new technology to meet production requirements may be for feed crops. Feed grains, hay, and pasture occupy



the bulk of our cropland and pastureland area. Achievement of the attainable yields estimated for feed crops and pasture as a group would not be sufficient to meet production requirements. If attainable yields for other crops were reached, however, and desirable related shifts in acreages occurred, our overall needs and production might be balanced.

Achievement of the level of yields estimated as attainable from present technology would not be easy. Yields of corn, for example, would have to increase at about the same rate as in the last two decades when full advantage was taken of hybrid corn seed. Past rates of increase would have to be accelerated to get attainable yields estimated for pasture.

Analysis of all the data assembled in the study is not complete. Some tentative conclusions from the analysis thus far can be offered, however. We cannot afford to be too complacent regarding our ability to increase farm output to the extent needed on the basis of present technological know-how and the moderate increases in cropland area that seem likely. We need more research and planning to raise research ceilings on crop yields so that efficient use can be made of all our cropland and pasture. Considerable research effort will be needed just to maintain high-level yields. Greater effort also needs to be directed to research and planning that will assist orderly adjustments in acreage and production.

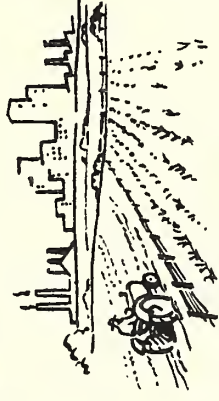
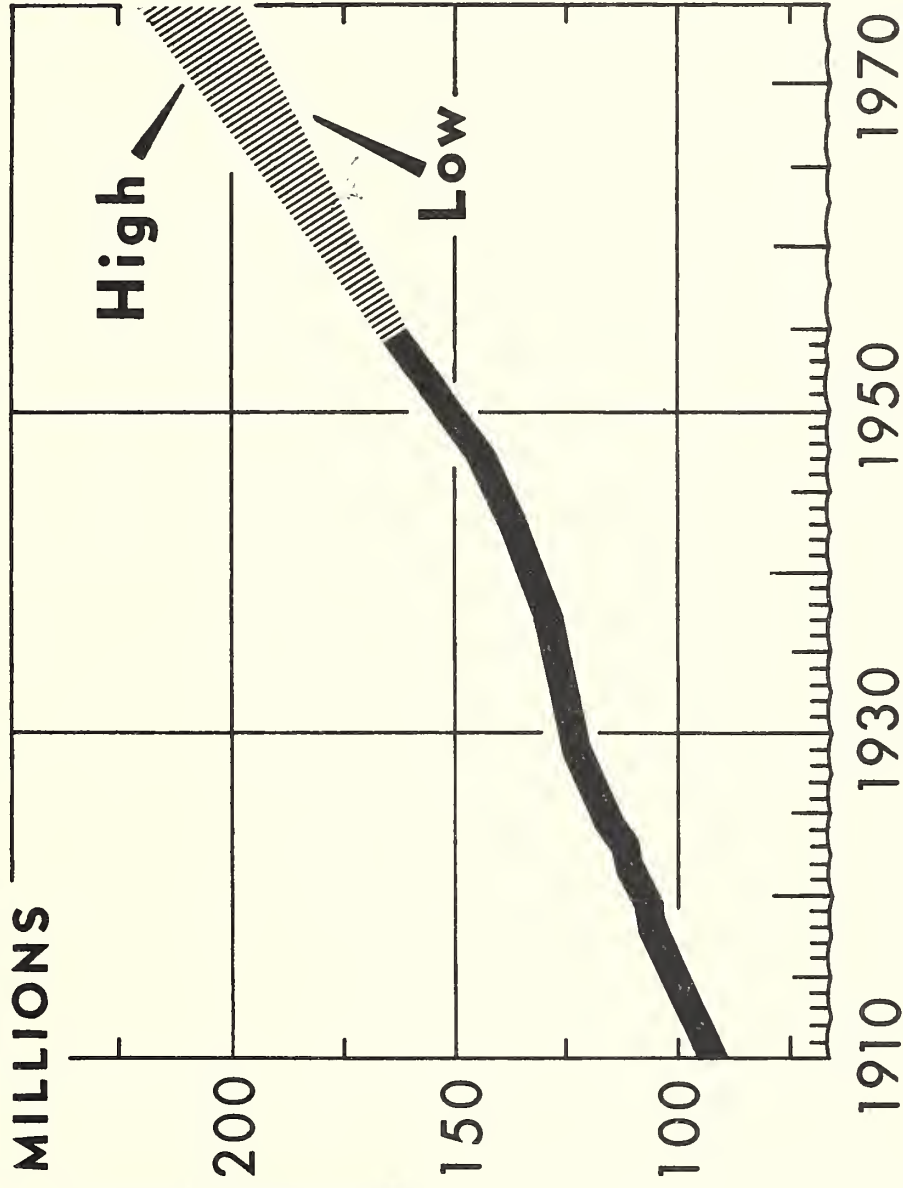
Work is still to be done on other planned phases of the study before more definite conclusions can be reached. Possibilities of further increasing the efficiency of feed use by livestock, for example, should be explored. Gains on this score would be equivalent to more crop and pasture acres or additional crop and pasture yields.

In the final analysis, guides to more effective research and planning efforts should be based to a great extent on the criterion of efficiency of use of production resources. A major test of our progress in agriculture in the future will be our ability to achieve the needed volume and pattern of production at decreasing cost per unit. It is hoped that contemplated work on the cost-reduction phases of the study will provide some guidelines to research that can help in integrating agriculture into a high-level, high-wage and high-income economy.



With Projections to 1975

# GROWTH OF U. S. POPULATION

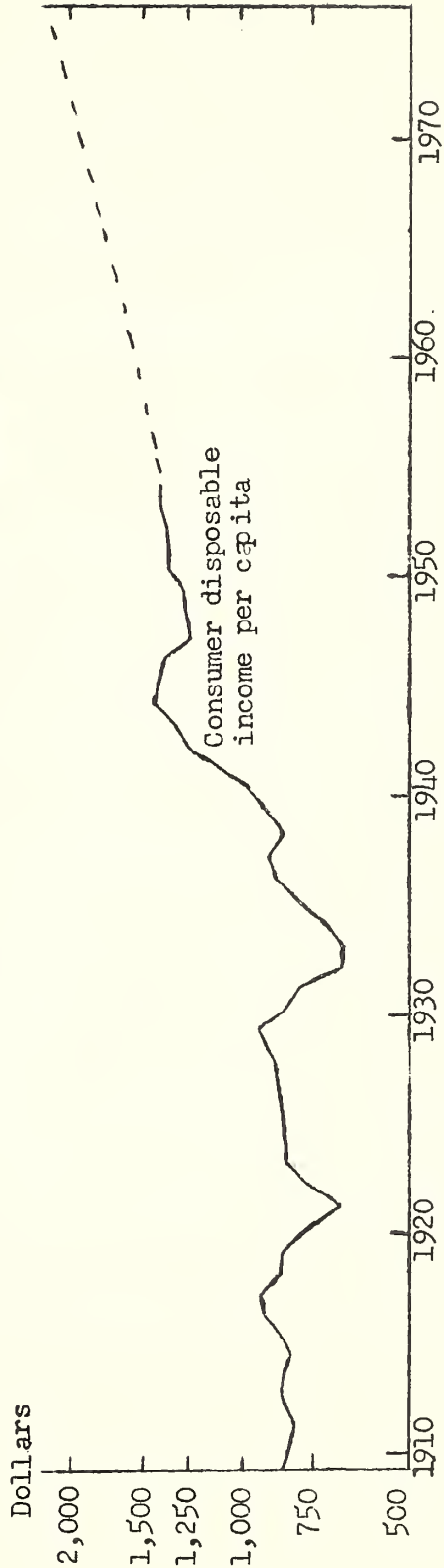
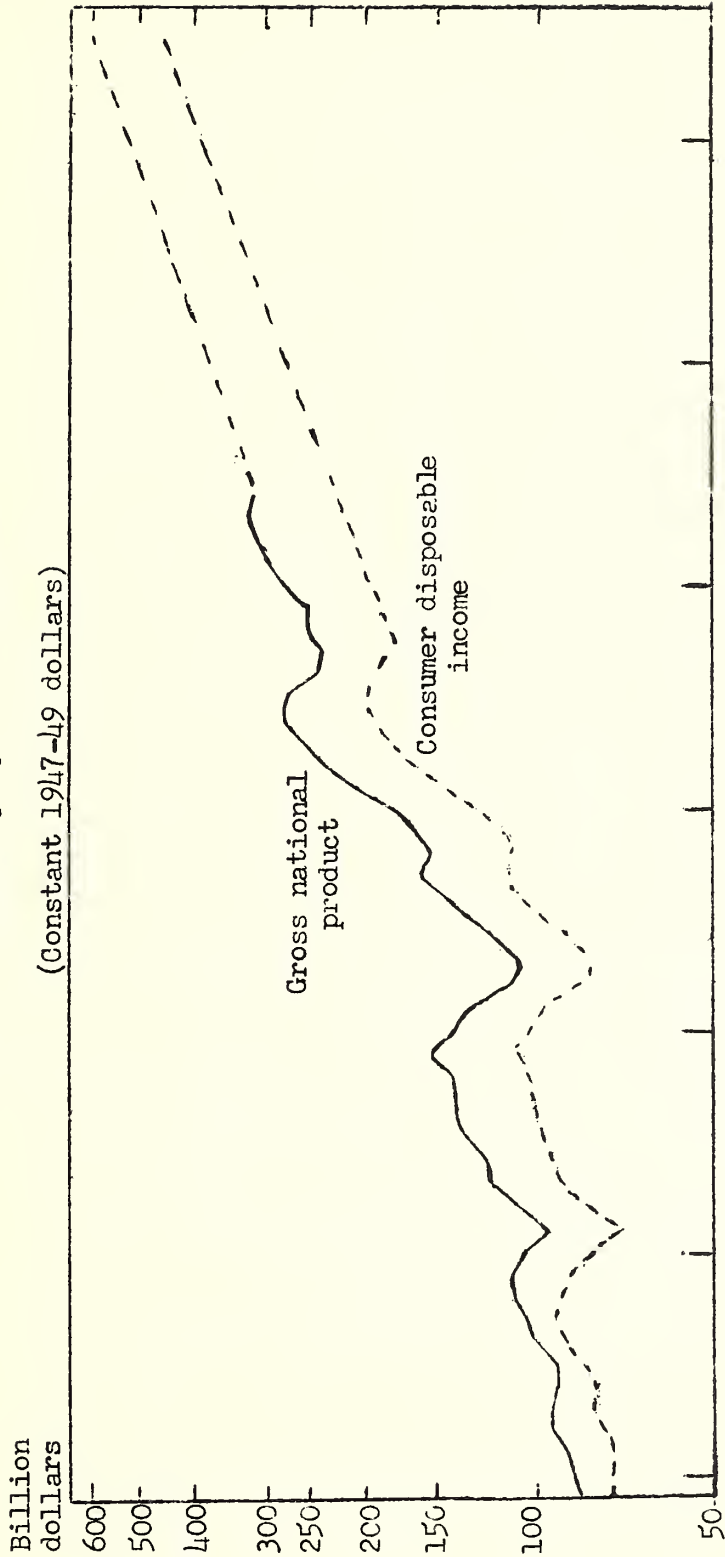


1910-53 ESTIMATES AND 1953-75 PROJECTIONS FROM CENSUS BUREAU





# Gross national product and consumer income 1909 to 1954 and projections to 1975



Source: Based on data from Department of Commerce and estimates by U.S.D.A.

Table 1.- Income elasticities with respect to quantity consumed and expenditures for selected foods, urban families in the United States, spring 1948 1/

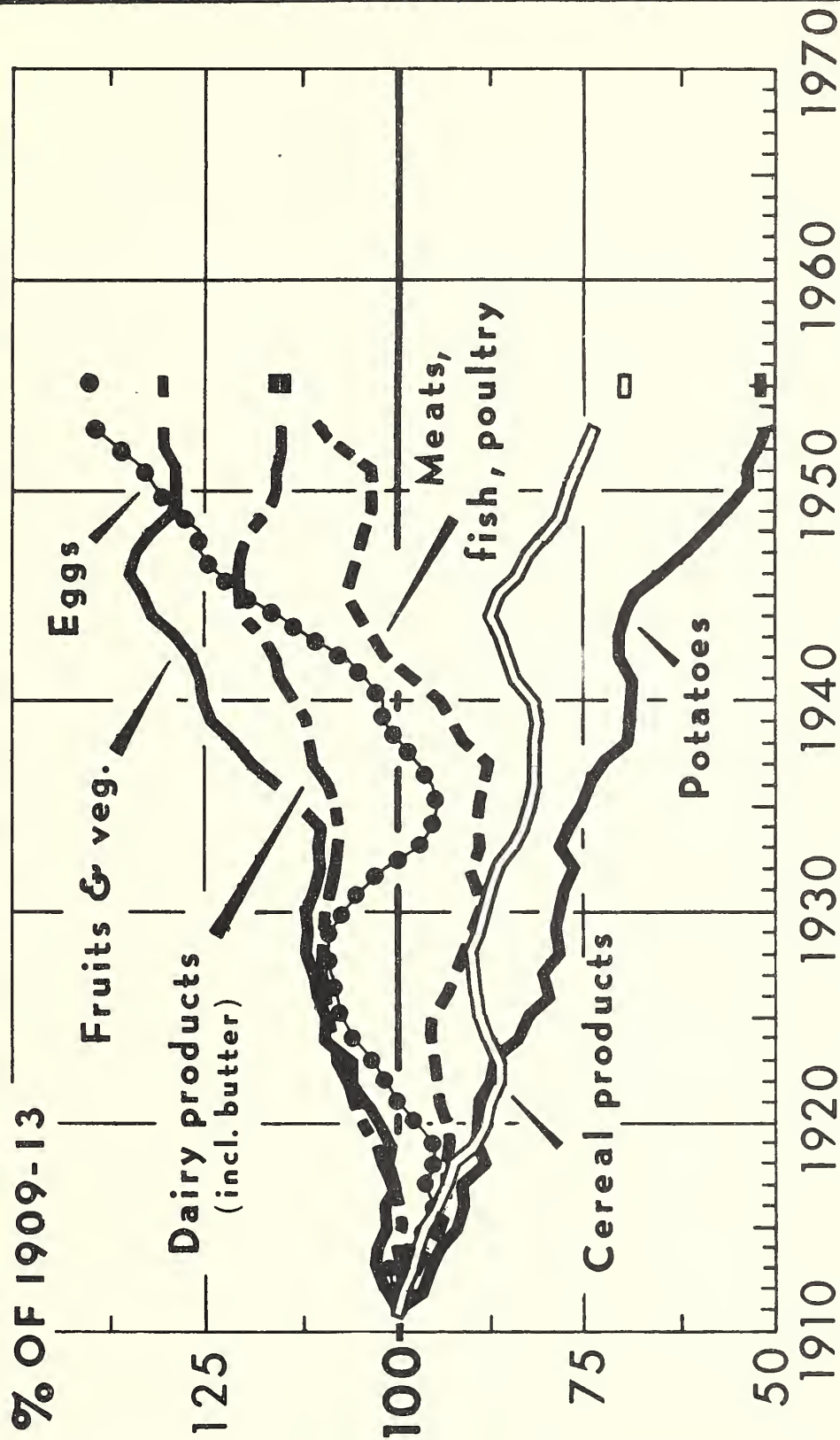
Food	Coefficient of elasticity	
	Quantity	Money value
Frozen fruits and vegetables	0.91	0.99
Beverages	---	.44
Fresh fruits	.31	.37
Canned fruits, vegetables, and juices	.19	.19
Meat, poultry, fish	.18	.27
Meat	.18	.27
Milk (equivalent)	.17	.22
Fresh vegetables	.16	.25
Eggs	.12	.14
Bakery products	.04	.09
For incomes under \$3,500	.14	.15
For incomes \$3,500 and over	-.16	-.03
Fats and oils	.04	.14
For incomes under \$3,500	.12	<u>2/</u>
For incomes \$3,500 and over	-.06	<u>2/</u>
Potatoes, sweetpotatoes	-.02	.02
For incomes under \$3,500	.18	.17
For incomes \$3,500 and over	-.30	-.20
Sugar, sweets	-.04	.15
For incomes under \$3,500	.09	.27
For incomes \$3,500 and over	-.25	-.11
Flour, meal, cereals, pastes	-.25	-.15

1/ Food used at home per household of 3.5 persons. Consumption was related to 1947 income after taxes. 2/ Not available.

These elasticities approximate percentage change in quantity purchased and expenditures for selected foods with a one-percent change in income. Elasticities are higher for money value than for quantity purchased due primarily to services and quality differences at different income level. For example, meat expenditures may reflect purchases of front quarter roasts at lower income levels compared with possibly the same quantity of hind quarter steaks at higher income levels.

Source: Food Consumption of Urban Families in the U. S., USDA, AI Bul. No. 132, p. 43.

# TRENDS IN OUR EATING HABITS\*



5-YR. MOVING AV. CENTERED.

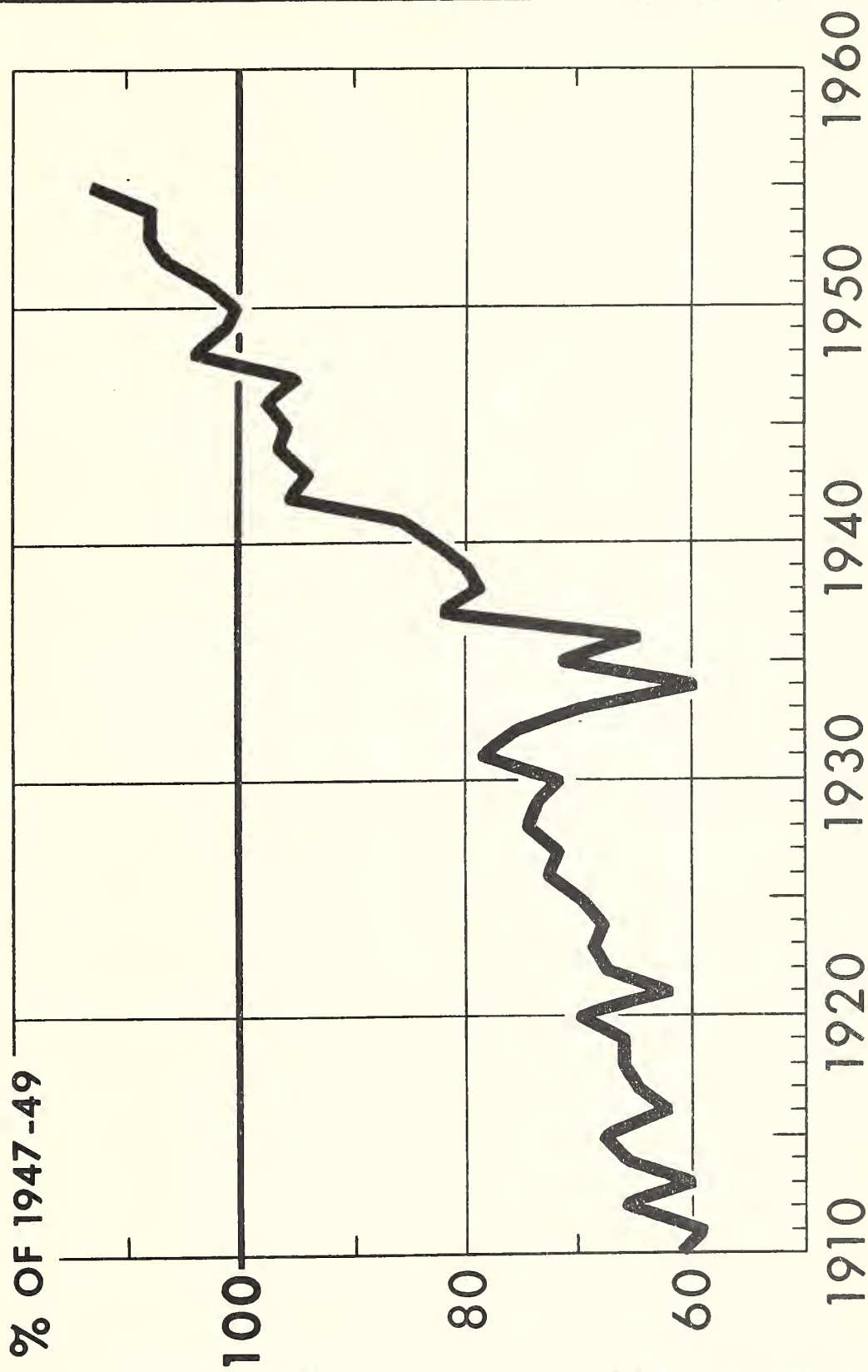
DATA FOR YEAR 1955 SHOWN BY SYMBOL.

\* PER CAPITA CIVILIAN CONSUMPTION, U.S. (USING 1947-49 RETAIL PRICES AS WEIGHTS).



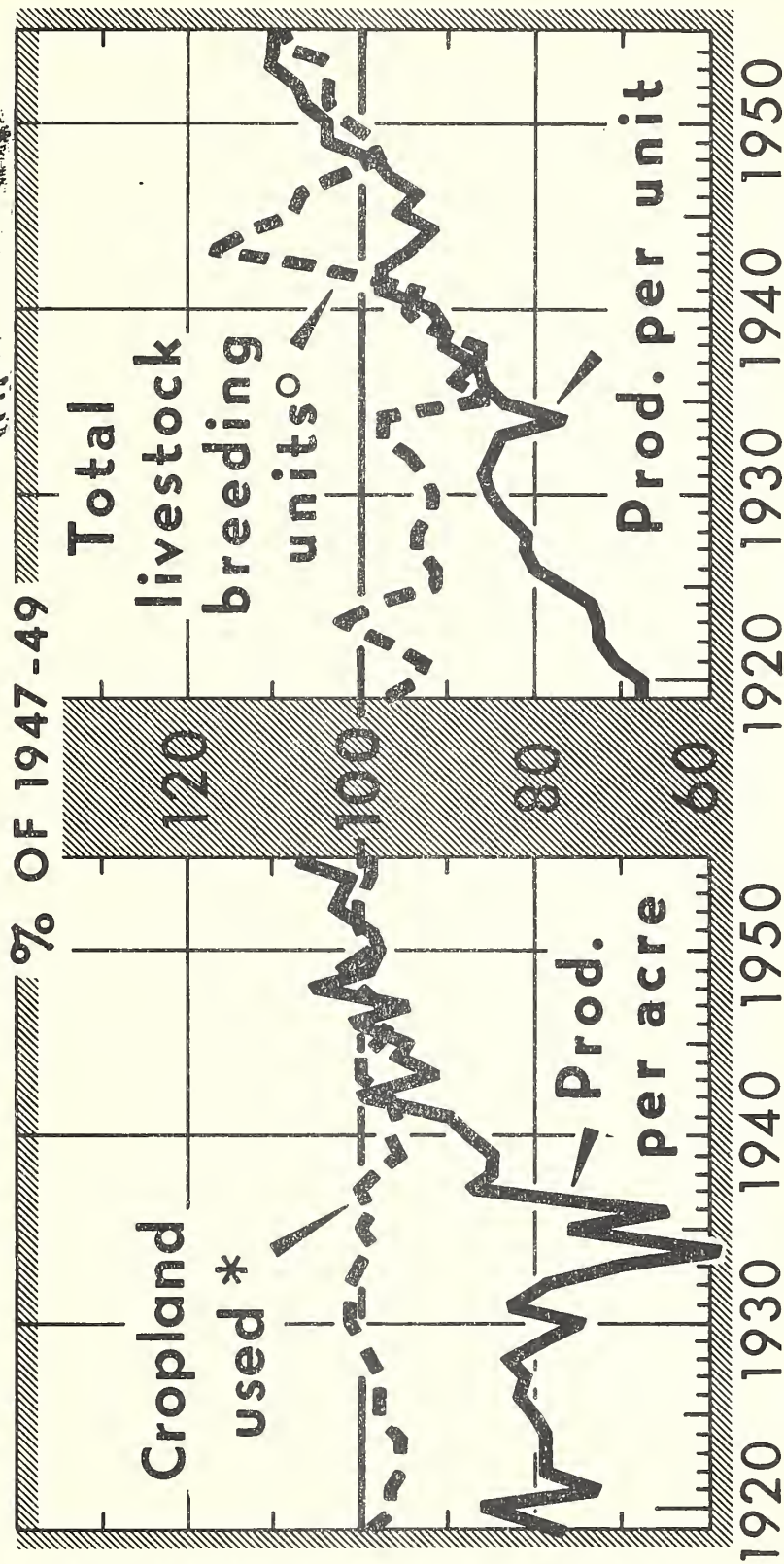


# U. S. FARM OUTPUT





# FARM PRODUCTION PER ACRE AND PER ANIMAL



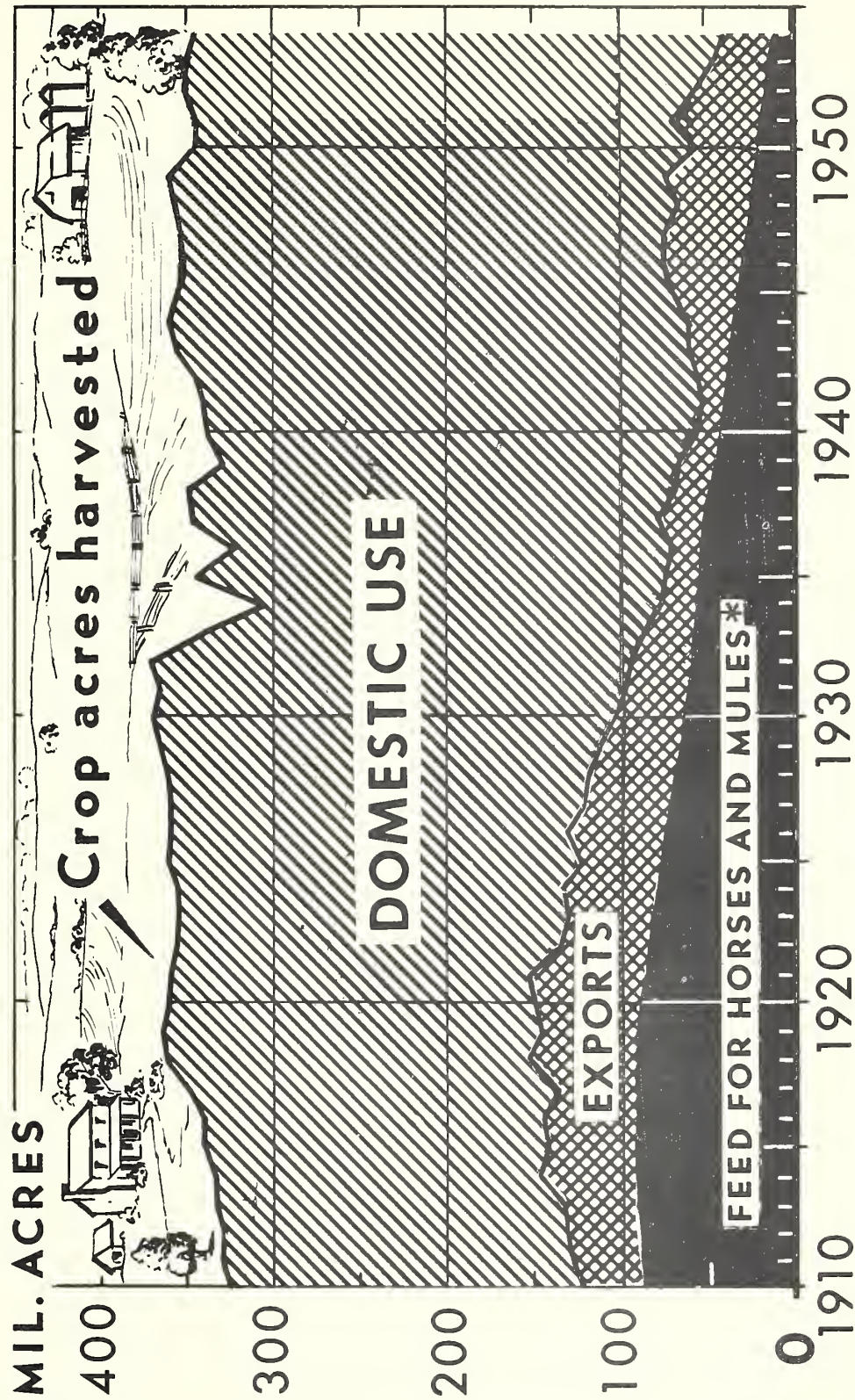
\*ESTIMATED ACREAGE FROM WHICH ONE OR MORE CROPS WERE HARVESTED  
PLUS ACREAGE OF CROP FAILURE AND SUMMER FALLOW

° INCLUDES ALL BREEDING LIVESTOCK EXCEPT HORSES, AND ALL LIVESTOCK PRODUCTION  
EXCEPT FARM-PRODUCED POWER OF HORSES AND MULES





# USES OF CROPLAND HARVESTED



\* FARM AND NONFARM





